PUBLIC HEALTH CONCEPTUAL DATA MODEL

Public Health Conceptual Data Model

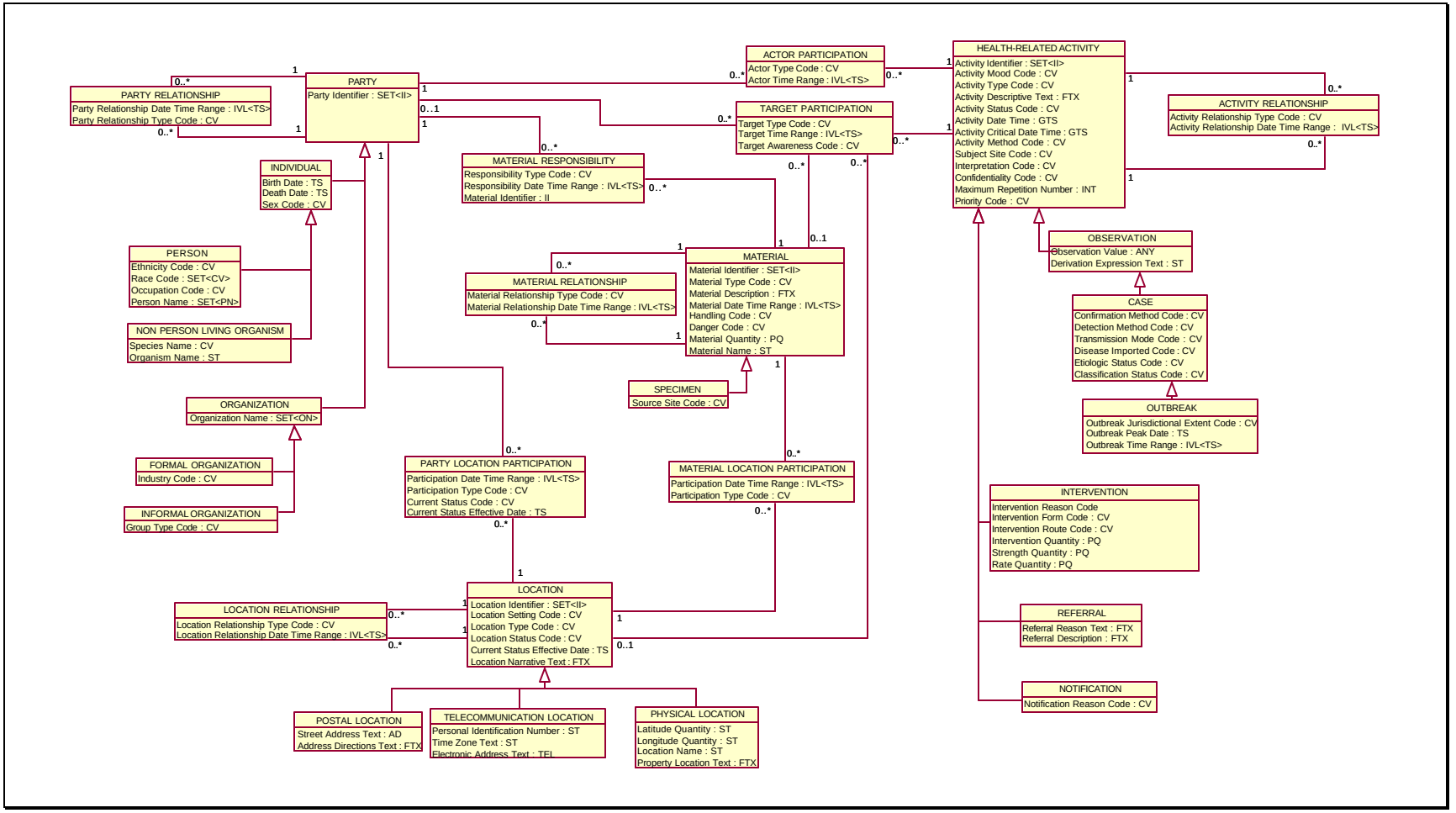

Figure 1. Public Health Conceptual Data Model Diagram

The model consists of 4 subject areas and contains 29 classes. These subject areas are based on the most general categorization of the data relevant to public health concerns. The four subject areas and the classes they contain are listed below.

HEALTH-RELATED ACTIVITIES

- ACTIVITY RELATIONSHIP
- ACTOR PARTICIPATION
- CASE
- HEALTH-RELATED ACTIVITY
- INTERVENTION
- NOTIFICATION
- OBSERVATION
- OUTBREAK
- REFERRAL
- TARGET PARTICIPATION

LOCATIONS

- LOCATION
- LOCATION RELATIONSHIP
- MATERIAL LOCATION PARTICIPATION
- PARTY LOCATION PARTICIPATION
- PHYSICAL LOCATION
- POSTAL LOCATION
- TELECOMMUNICATION LOCATION

MATERIALS

- MATERIAL
- MATERIAL RELATIONSHIP
- MATERIAL RESPONSIBILITY
- SPECIMEN

PARTIES

- FORMAL ORGANIZATION
- INDIVIDUAL
- INFORMAL ORGANIZATION
- NON-PERSON LIVING ORGANISM
- ORGANIZATION
- PARTY
- PARTY RELATIONSHIP
- PERSON

Detailed descriptions of the classes and attributes are contained in the sections for each subject area.

Health-related Activities Subject Area

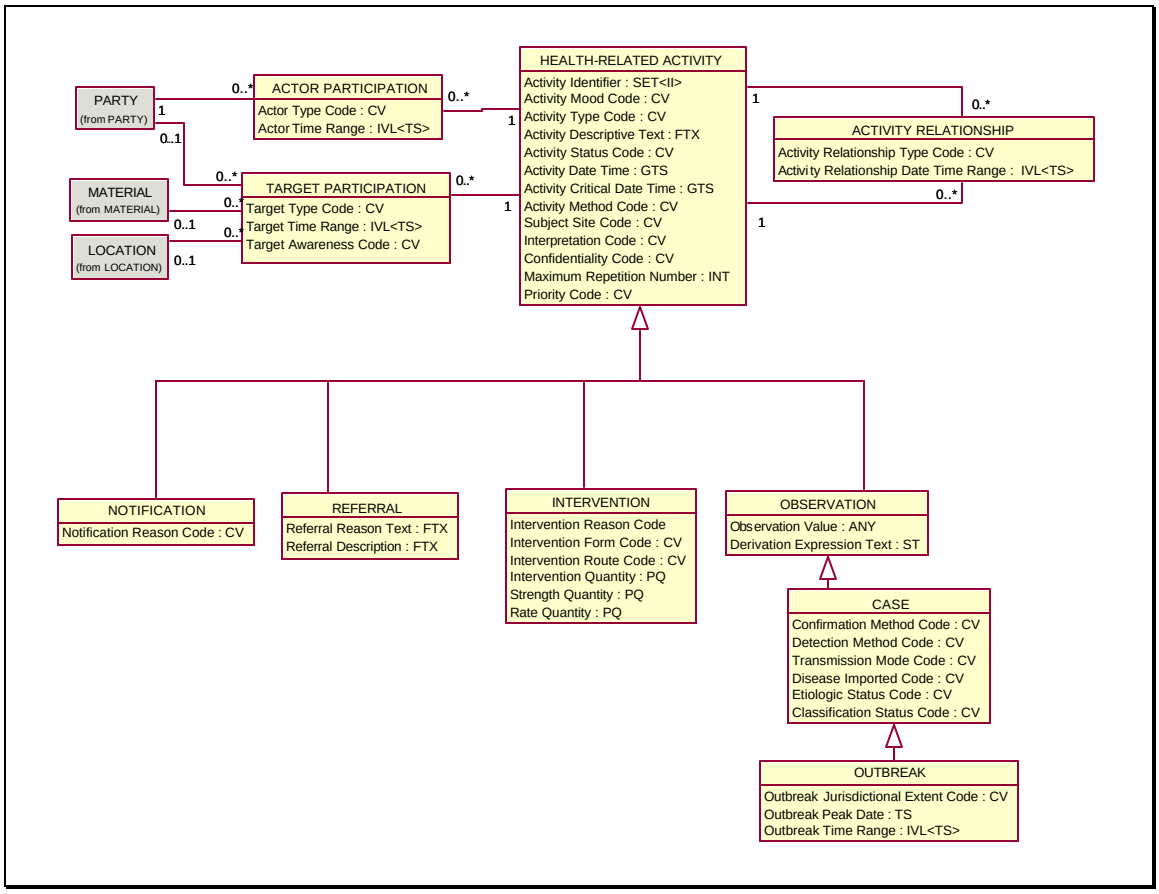

Figure 2. Health-related Activities Subject Area Diagram

The classes and attributes of the Health-related Activities subject area are described below.

Class: **ACTIVITY RELATIONSHIP**

Associated with: **HEALTH-RELATED ACTIVITY**

Description of: **ACTIVITY RELATIONSHIP**

Activity relationship captures the relationship between a pair of health-related activities. Generally, relationships between health-related activities fall into three categories: an activity can be comprised of component activities; one activity can cause another; one activity can be associated with another for any number of reasons.

Virtually any activity can be decomposed into its parts. In public health, an outbreak of a particular disease can be composed of multiple individual cases of a particular disease. To take a medical example, consider a surgical procedure, e.g., a laparoscopic cholecystectomy. This action consists of many smaller actions that must occur in the right order and relation to each other. In the case of an invasive surgery, preoperative preparation may be required as a precondition, while anesthesia is conducted in parallel to the entire surgical procedure.

Causal associations are used to provide explanations for actions. For example, an episode is defined as a case of a particular disease (event reportable to public health) because of the results of a clinical evaluation combined with laboratory test results. (Note that the definition of the case specifies these criteria.) Another example is the instance of a test that was performed because of the results of two earlier tests.

The notion of "associated with" is more general than “causal” and "comprised of" associations. For example, in public health, a reportable case of disease is commonly associated with multiple observations. These observations record such items as specific behaviors that put the person at risk, the person's visits to locations where they might have been exposed, or the test results that indicate the person has a particular disease.

Associations for: **ACTIVITY RELATIONSHIP**

relates (1,1) :: HEALTH-RELATED ACTIVITY :: is_target_for (0,n)

Attributes of: **ACTIVITY RELATIONSHIP**

Activity Relationship Type Code : CV

The code that reflects the nature of the relationship that exists between two or more associated health-related activities. The possible values include “comprises”, “causes”, and “is associated with”. An example of a “comprises” relationship is a case definition that is *comprised* of laboratory tests, symptoms, and other qualifying criteria. An example of a “causes” relationship is a case notification *causes* a case investigation. An example of an “is associated with” relationship is an outbreak and the *associated* cases.

Activity Relationship Date Time Range : IVL<TS>

The period of time during which the relationship between the two activity instances is effective.

Class: **ACTOR PARTICIPATION**

Associated with: **HEALTH-RELATED ACTIVITY**

PARTY

Description of: **ACTOR PARTICIPATION**

Actor participations include the active roles played by a party in the health-related activity. Examples include an organization that provides physical therapy services, a person who performs a surgical procedure, a public health worker who tracks contacts of an infectious case, a person who conducts a test, and a person who conducts an interview.

Additional examples of actor participations are: a) the part played by an epidemiologist or CDC program staff (party) in generating a public health case definition; b) the part played by a provider, State or Local Health Department (party) in the notification of a case.

Associations for: **ACTOR PARTICIPATION**

associates_to (1,1) :: HEALTH-RELATED ACTIVITY :: **associates (0,n)**

associates_to (1,1) :: PARTY :: **associates (0,n)**

Attributes of: **ACTOR PARTICIPATION**

Actor Time Range : IVL<TS>

The time range during which the associated party participated in the health-related activity while taking on the role indicated by the specified actor type code value.

Actor Type Code : CV

Identifies the particular function or a set of functions that a party performs in the health-related activity. Note that the actor type code designates the actual function performed in a particular health-related activity in distinction to other roles or occupation. Examples of actor type codes might include case investigator, interviewer, and disease investigation specialist.

Class: **CASE**

Subtype of: **OBSERVATION**

Supertype of: **OUTBREAK**

Description of: **CASE**

A case is an observation that represents a condition or event that has a specific significance for public health. The case can include a health-related event concerning a single individual or it may refer to multiple health-related events that

are occurrences of the same disease or condition of interest to public health. An outbreak involving multiple individuals is a type of case.

A case definition (a case whose mood code = "definition") includes the description of the clinical, laboratory, and epidemiologic indicators associated with a disease or condition of interest to public health. There are case definitions for conditions that are reportable, as well as for those that are not. There are also case definitions for outbreaks. A case definition is a construct used by public health for the purpose of counting cases, and should not be used as clinical indications for treatment. Examples include AIDS, toxic-shock syndrome, and salmonellosis and their associated indicators that are used to define a case.

Attributes of: **CASE**

Classification Status Code : CV

Code for the classification status of the case. Possible values include confirmed, probable, suspected, not a case, incomplete information. This status code differs from the activity status code inherited from the health-related activity supertype to case. The activity status code captures the lifecycle state of the case (active, inactive, completed).

Confirmation Method Code : CV

Code for the mechanism by which the case was confirmed. This attribute is intended to provide information about how the case classification status was derived. Includes laboratory criteria met, clinical case inclusion criteria (alone) met, epidemiologist- or other public health worker-assigned, epidemiologically linked via investigation, and physician-reported.

Detection Method Code : CV

Code for the method by which the case was identified. Possible values include provider report, patient self-referral, laboratory report, case or outbreak investigation, contact investigation, active surveillance, routine physical, prenatal testing, prenatal testing, prison entry screening, occupational disease surveillance, and medical record review.

Disease Imported Code : CV

Code that indicates whether the disease was likely acquired outside the jurisdiction of observation, and if so, the nature of the interjurisdictional relationship. Possible values include not imported, imported from another country, imported from another state, imported from another jurisdiction, and insufficient information to determine. Note that if the specific jurisdiction is to be captured it is captured as a target participation associated with a jurisdictional party.

Etiologic Status Code : CV

Code for the strength of the causal relationship between the disease-causing agent and the disease. This is particularly relevant for outbreaks where the cause is not yet certain, or emerging/new diseases or conditions where the cause is not clear. For example, in the case of an outbreak of gastroenteritis, blood in the stool may indicate that the agent was most likely a Shiga toxin-producing *E. coli* (strong suspicion), although other infectious or toxic agents may still be included in the differential diagnosis, but to a lesser degree (weak or moderate suspicion). Includes weak suspicion, moderate suspicion, confirmed, and unknown.

Transmission Mode Code : CV

Code for the mechanism by which disease was acquired by the party involved in the case. Includes sexually transmitted, airborne, bloodborne, vectorborne, foodborne, zoonotic, nosocomial, mechanical, dermal, indeterminate.

Class: **HEALTH-RELATED ACTIVITY**

Supertype of: **INTERVENTION**
NOTIFICATION
OBSERVATION
REFERRAL

Associated with: **ACTIVITY RELATIONSHIP**
ACTOR PARTICIPATION
TARGET PARTICIPATION

Description of: **HEALTH-RELATED ACTIVITY**

A health-related activity is an action performed for the purpose of documenting, investigating, or improving the health condition of a party. It may also include documenting the ability to affect the health status of a party. Examples of health-related activities include all of the following:

- interventions such as surgical operations or vaccination;
- administration of a medication;
- referral to another provider;
- diagnostic observations about a patient's condition;
- diagnostic assessment that a condition meets the public health definition of a case;
- a public health notification of a case of a reportable disease or condition;

- public health investigation of all persons exposed to a common source of infection or toxin;
- food or consumer product recalls;
- an intervention targeted at a given population.

An instance of a health-related activity can be captured from several perspectives. Possible perspectives for an instance of a health-related activity are:

- a **fact** about an activity that has occurred, such as the observation of chickenpox in a child;
- a **command**, such as an order to vaccinate a child for chickenpox;
- a **master** table entry of possible activities, such as types of laboratory tests;
- a **definition** algorithmically describing an activity, such as a case definition for chickenpox;
- an **intent** for an outcome of an activity, such as achievement of a 95% immunization rate in children under age 2.

Associations for: **HEALTH-RELATED ACTIVITY**

is_source_for (0,n) :: ACTIVITY RELATIONSHIP :: **relates (1,1)**

is_target_for (0,n) :: ACTIVITY RELATIONSHIP :: **relates (1,1)**

associates (0,n) :: ACTOR PARTICIPATION :: **associates_to (1,1)**

associates (0,n) :: TARGET PARTICIPATION :: **associates_to (1,1)**

Attributes of: **HEALTH-RELATED ACTIVITY**

Activity Critical Date Time : GTS

The "biologically relevant" time for a health-related activity. The concept is best understood with observations, where the time of the observation activity may differ from the time of the observed feature. For instance, in history taking, when the doctor records an episode of Hepatitis A suffered by the patient last year for several weeks. The activity critical date time is the date/time when the patient experienced the episode of Hepatitis A, and not the date and time when the doctor records the history. That is to say, it is the time/dates that the patient actually had hepatitis, and not when the patient tells the doctor, or when the doctor records it. In another example, the provider may order a test, conducted on a blood sample drawn today, for which results will not be available until next week. The activity

critical date time is the date and time of the taking of the specimen, not when the results are available.

Activity Date Time : GTS

The time when the action happened, is ordered or scheduled to happen, or when it can possibly happen. The time specification could be a point in time, a time range during which the activity occurred, or is supposed to occur.

Activity Descriptive Text : FTX

The description of an activity is a piece of free text or multimedia data that describes the activity in all necessary detail. This attribute is a descriptive supplement to an activity type code, not a replacement. There is no restriction on length or content imposed on the description attribute. However, the content of the description is not considered part of the functional information communicated between systems. Descriptions are meant to be shown specifically to interested individuals.

Activity Identifier : SET<II>

This is an instance identifier for a health-related activity. It uniquely identifies a particular instance of a health-related activity class.

Activity Method Code : CV

The activity method code is a parameter of the health-related activity that specifies one of the possible methods used to achieve a given end. The method is specified for a given health-related activity, because there are different methods to achieve results, and knowing the method is important for a more explicit interpretation. For example, when carrying out an assessment of a person's risk-taking behavior, possible methods include: written questionnaire, personal interview, third-party interview (for children), and medical record review. When carrying out interventions for public health education, possible methods include: mass media, billboard, individually targeted automatic messages, and individual counseling.

Activity Mood Code : CV

The activity mood code determines the meaning or context for the activity. The activity (corresponding to a verb in natural language) may be conceived as an event that happened (fact), an ordered service (command), a possible service (master), an algorithm for describing an event (definition), and a goal of health-related activity (intent). Each of these is a different mood.

The activity mood code is critical to the design of this model. Without it, the model described here would be at least three times as big, in order to distinguish between the following:

a) The definition of the health-related activity (e.g., a case or test definition);

b) Health-related activities that are planned;

c) Scheduled health-related activities;

d) Health-related activities that have already occurred or been performed.

Activity Status Code : CV

A code for the state of the action (e.g., intended, ordered, in process, completed). This attribute is not used to describe the classification status of a case; the case classification status code should be used. (See the case attribute: case classification status code.)

Activity Type Code : CV

A code for the kind of activity (e.g., physical examination, person interview, serum potassium, public health notification, product sterilization or pasteurization). The activity type code specifies the service conceptually by using a code from a coding system. The activity type code or "name" is a handle on the concept of the action, not on the individual action instance. Different coding systems cover different kinds of activities, which is why there is not one single coding system to be used for the activity type code.

When observations are recorded for outbreaks, the activity type code captures information to indicate the category of the statistic, e.g., number ill, number exposed, number hospitalized, number treated, number of fatalities, number interviewed, incubation period days/hours, duration of illness (days/hours), number not ill, % female, % male, % less than 18 years of age, ages of affected, and information to indicate the type of statistic, e.g., minimum, maximum, percentage, median, count.

Confidentiality Code : CV

Indicates limitations to disclosure and communication of information about a health-related activity. Includes provider access only, limited to county or state public health department access, disease program access only, or public use/ publicly available.

Interpretation Code : CV

The interpretation code allows for a very rough interpretation of the course or outcome of an activity. These are sometimes called "abnormal flags", however the judgment of normalcy is just one of the common rough interpretations, and is often not relevant. For example, for the observation of a pathologic condition, it doesn't make sense to state the normalcy, since pathologic conditions are not considered "normal." In other words, context is required to make a final

determination, and this code may simply provide a judgment that these data are worth investigating further. For example, this code may be used to indicate that an antibody level is slightly elevated, which may be consistent with disease. However, the interpretation of disease may require additional data, such as a repeated antibody titer, to determine whether the value is rising or falling. This attribute is also used to describe antibiotic susceptibility results as "susceptible", "intermediate", and "resistant".

Maximum Repetition Number : INT

The maximum number of repetitions of a health-related activity. Typical values are 1, some other finite number, and infinity. This is relevant when the health-related activity is a plan or a series of orders.

Priority Code : CV

Code for the priority of the activity. Possible values include routine, emergency, and urgent.

Subject Site Code : CV

Most health care services focus on a particular part of the target on which the health-related activity is performed. Typically, when the target party is a person, this will be a feature related to the anatomic structure of the patient (the "target" of the service). In the case of material entities other categorizations are used. For example, when a sample is ordered from a restaurant to explain a case of food poisoning, sites such as floor, meat grinder, refrigerator, or cutting board could be used.

Class: **INTERVENTION**

Subtype of: **HEALTH-RELATED ACTIVITY**

Description of: **INTERVENTION**

An intervention is the administration of a substance or technique to provide care for or to prevent a condition. This includes vaccinations and preventive therapy as well as medication given directly for therapeutic purposes. An intervention need not be administered solely to individuals, and may include population interventions such as chlorinating or fluoridating the water supply, policies to restrict tobacco sales, pasteurization of milk, and pesticide application in a specific geographic area. Includes therapeutic and preventive treatments, counseling, educational campaigns, needle exchange programs, media campaigns, food recalls.

Attributes of: **INTERVENTION**

Intervention Form Code: CV

The physical form in which the intervention is delivered. For medications, examples include tablet, capsule, suppository, and solution. For environmental interventions, such as chlorination of the water supply, examples might include chlorine in liquid or tablets. For food recalls, examples might include complete meat packages or individual burgers. For media campaigns, examples might include television commercials, radio ads, billboards, or pamphlets.

Intervention Quantity : PQ

The amount of the intervention associated with a single intervention instance. For example, this might refer to the amount of pesticide to be sprayed during a single application or the amount of gas or chemical to be used in a sterilization of a medical device.

In the case of medication, the amount is the dose or amount of the therapeutic or prophylactic agent given at one administration event. This attribute can be used all by itself, or in combination with a strength.

Intervention Reason Code : CV

Code which describes the basis for the intervention. Includes treatment, prophylaxis, post-exposure prophylaxis, high-risk individual or population.

Intervention Route Code : CV

The route by which the intervention is administered to the object of the intervention. For medications, includes oral, intravenous, subcutaneous, subdermal, and intramuscular. Medication route is similar to an anatomic body site through which the therapeutic or prophylactic agent is incorporated or otherwise applied to the body. Other kinds of intervention routes might include: via public health nurse counseling, billboard campaign, newspaper advertisement, helicopter spray (for pesticide treatment), injection of water supply (for fluoridation).

Rate Quantity : PQ

The period of time over which a specified dose is delivered. This attribute only applies to continuously divisible intervention forms such as fluids and gases. In this case, the intervention rate indicates the amount of intervention within a specified period of time. The rate quantity is a duration (physical quantity in time), and it is the denominator of the intervention rate, while intervention quantity is the numerator. For example, pesticide to be used for mosquito abatement may be delivered at a rate of 20 liters per minute from a spray applicator.

Strength Quantity : PQ

The strength of an intervention is the amount of the agent per each unit of administration. This applies to pesticides, chlorination as well as medication. If the intervention form is continuously divisible (e.g., fluid, gas), the strength is a concentration.

When the strength attribute is used, the actual administered amount is the product of intervention quantity and strength quantity.

Class: **NOTIFICATION**

Subtype of: **HEALTH-RELATED ACTIVITY**

Description of: **NOTIFICATION**

A notification is an interaction with a caseworker, person or party to report or document a condition or health-related activity of importance to the health of the public. Includes notification by a provider to a patient that they have a disease, report by a provider or laboratory to public health of a case or positive isolate, report of a gunshot wound to police, reminder of the need for immunization against disease, notification of a possible adverse reaction to a drug.

Attributes of: **NOTIFICATION**

Notification Reason Code: CV

Code for the reason for the notification. Examples might include reportable condition, positive laboratory test, positive screening results, self-motivated, interview, referral, and positive gonorrhea test.

Class: **OBSERVATION**

Subtype of: **HEALTH-RELATED ACTIVITY**

Supertype of: **CASE**

Description of: **OBSERVATION**

Observations are actions performed in order to determine an answer or result value. Observation result values are specific information about the observed object. The type and constraints of result values depend on the kind of action performed.

An observation, according to Webster's, is an "act of recognizing and noting a fact [...] often involving measurement with instruments" and at the same time an observation is also "a record or description so obtained" [i.e., obtained through recognizing and noting]. Thus an observation is both the action and measurement

"procedure" and the resulting information that was obtained. The model understands the result to be entirely dependent on the observation action, and thus models the result as a component (attribute) of the Observation action rather than as an independent entity.

The following concepts are included as observations:

- A **test** is a procedure followed to objectively measure or evaluate the presence or status of a condition. It includes vital signs, physical exams, food tests, animal tests, height, and weight;
- An **assessment of causality** is the relationship between a patient condition and a source that may be causally related to that condition;
- A **vehicle condition** is the circumstances under which the vehicle became a carrier for a disease-causing agent. An example of a vehicle condition includes temperature abuse in storing or preparing food;
- A **diagnosis** is the conclusion drawn from analysis of the signs and symptoms exhibited or described by an individual;
- A **party condition** is the state of health, contamination, or infection of a party;
- A **health status inquiry** is the account of a party's health-related background. This could include an interview conducted anonymously as part of a risk factor survey. It includes description of current symptoms; risk behaviors such as alcohol, tobacco, or other drug use; exposures past and present; medical or surgical history; current or previous medications, vaccinations, or interventions (treatment or prophylactic); reproductive history; occupational history or exposures; sexual habits; eating habits; travel history; educational background; marital status; family history. For example, the patient's, parent's, or guardian's report of drug use, life style, previous medical conditions, and treatments.

In the public health context, case and outbreak information are captured as observations. This includes information such as a count or percentage of cases tracked for public health reporting. It also includes number ill, number exposed, number hospitalized, number treated, number of fatalities, number interviewed, incubation period, duration of illness, number not ill, % female, % male, and % less than 18 years of age.

Attributes of: **OBSERVATION**

Derivation Expression Text : ST

The derivation expression text shows how an observation can be derived from other observations. In this case, the activity relationship links the observations

through the value of the relationship code (activity relationship type code = "derivation").

For example, to define a derived observation for a change in antibody titer, one will associate the change in titer observation with the acute titer observation and the convalescent titer observation. The derivation expression text would then be "Change in Titer = Convalescent Titer / Acute Titer". If this observation value is abnormal, for example greater than 4, this would be indicated in the Interpretation Code for the Change in Titer observation.

Observation Value : ANY

The result value of an observation activity. This value can be of any datatype. This fact reflects the many different ways in which the value of an observation can be captured. For outbreaks or reporting of aggregate numbers of cases, the number of persons affected would be included as a value here.

It is worth noting that, as a result of the functionality introduced with the activity mood code, reference values or ranges are captured as observation values. The fact that an observation carries a reference value is indicated by the value of the mood code.

Class: **OUTBREAK**

Subtype of: **CASE**

Description of: **OUTBREAK**

An outbreak or cluster is the occurrence in a community or region of cases of a condition of public health importance in excess of those normally expected. The designation of an outbreak implies that a public health assessment of causality or at least of relatedness among cases has taken place. An outbreak is considered to be a special type of case (where a case, in this instance, may include many affected individuals), and may not simply be an aggregate of multiple cases although an outbreak may also be designated as an aggregate of multiple individual cases.

Given that an outbreak is a subtype of observation, the number of parties (which will generally equate to the number of cases) affected by the outbreak is captured as the observation value.

Attributes of: **OUTBREAK**

Outbreak Jurisdictional Extent Code : CV

Code for the qualitative measure of the number of jurisdictions involved. Possible values include single jurisdiction, multi-county, multi-state, and multi-national.

Note that if the specific jurisdictions are to be captured they are captured as target participations associated with a jurisdictional party.

Outbreak Peak Date : TS

Date of onset for the highest number of cases (mode) associated with the outbreak.

Outbreak Time Range : IVL<TS>

The period of time during which the outbreak takes place. The date on which an outbreak starts is the earliest date of onset among the cases assigned to the outbreak, and its ending date is the last date of onset among the cases assigned to the outbreak.

Class: **REFERRAL**

Subtype of: **HEALTH-RELATED ACTIVITY**

Description of: **REFERRAL**

A referral is an introduction of an individual or individuals from one health care organization to another, or from one part of an organization to another for the purpose of diagnosis or treatment. It includes the referral of a case or the referral of multiple exposed persons (or cases) by one State Health Department to another.

Attributes of: **REFERRAL**

Referral Description: FTX

Free form text describing the referral.

Referral Reason Text: FTX

Free form text providing the reason for the referral as well as the action that is expected or requested upon receipt of the referral. Examples might include partner, positive lab test, outside of referring jurisdiction and needs follow-up, possible cancerous lesion for biopsy, and requires surgical intervention.

Class: **TARGET PARTICIPATION**

Associated with: **HEALTH-RELATED ACTIVITY**
LOCATION
MATERIAL
PARTY

Description of: **TARGET PARTICIPATION**

Target participations include the passive parts played by a party in the health-related activity. The target of a health-related activity can be any party or material, including humans, other non-person living organisms, and inanimate material.

For example, within a disease investigation, the person identified as an actual or potential carrier is a target of the activity. If the "patient" is a child, and another person, such as a parent, speaks for them (e.g., answering a questionnaire) that representative is also an activity target.

Associations for: **TARGET PARTICIPATION**

associates_to (1,1) :: HEALTH-RELATED ACTIVITY :: **associates (0,n)**

associates_to (0,1) :: LOCATION :: **associates (0,n)**

associates_to (0,1) :: MATERIAL :: **associates (0,n)**

associates to (0,1) :: PARTY :: **associates (0,n)**

Attributes of: **TARGET PARTICIPATION**

Target Awareness Code : CV

Indicates whether the associated patient or family member is aware of the health-related activity, and especially of the observation made. This is only relevant for persons who are targets of a health-related activity. For example, a patient (or his family members) may not be aware of a malignancy diagnosis, the patient and family may be aware at different times, and some patients may go through a phase of denial.

Target Time Range : IVL<TS>

The time range in which the associated party or material was a target of the specified target type code in the associated activity.

Target Type Code : CV

Identifies the particular role in which the party appears as the target of the health-related activity.

Examples of target type codes include: "State reporting case", "target of case", "location imported from".

Locations Subject Area

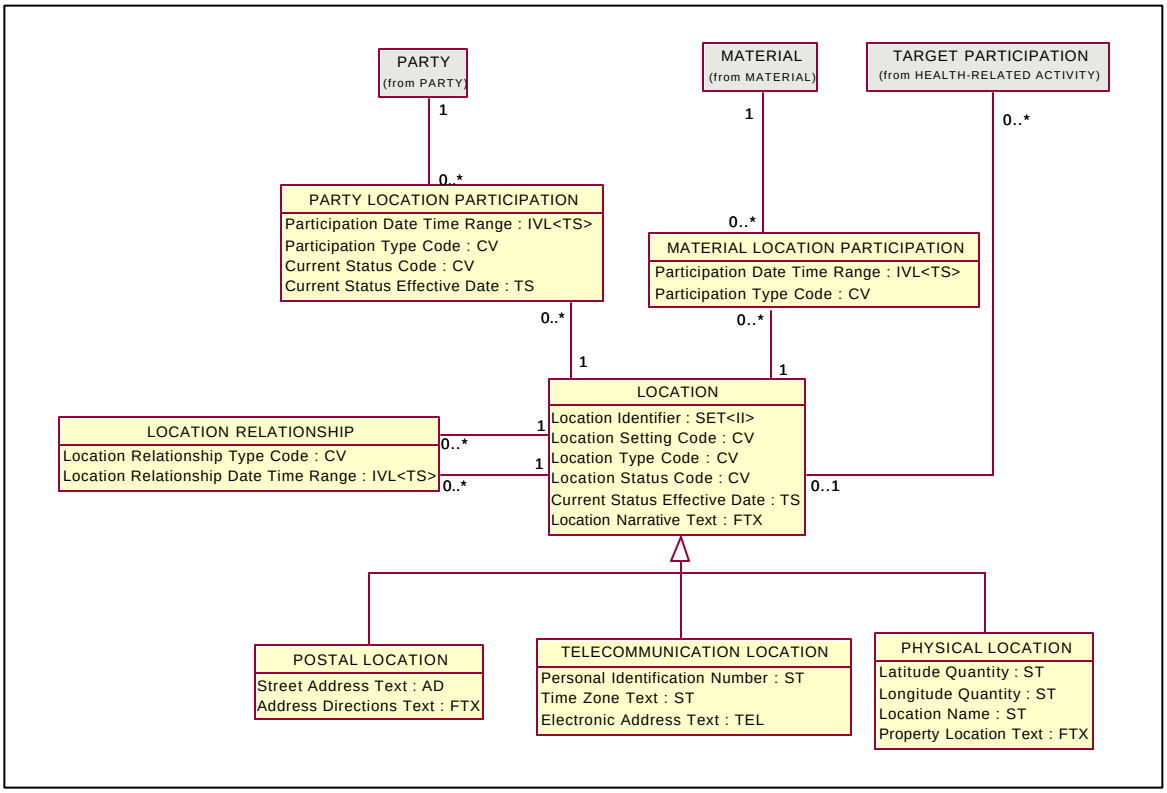

Figure 3. Locations Subject Area Diagram

The classes and attributes for the Locations subject area are described below.

Class: **LOCATION**

Supertype of: **PHYSICAL LOCATION**
POSTAL LOCATION
TELECOMMUNICATION LOCATION

Associated with: **LOCATION RELATIONSHIP**
LOCATION RELATIONSHIP
MATERIAL LOCATION PARTICIPATION
PARTY LOCATION PARTICIPATION
TARGET PARTICIPATION

Description of: **LOCATION**

A location is a site of interest to public health. Examples of locations include buildings, picnic grounds, regional areas, homes, test locations, specimen locations, hospitals, day care centers, prisons, and other potential transmission

locations. It also includes districts - that is to say one location may contain another. The information for a location includes information such as an address that makes it possible to find or to send messages to the location.

Associations for: **LOCATION**

is_source_for (0,n) :: LOCATION RELATIONSHIP :: **relates (1,1)**

is_target_for (0,n) :: LOCATION RELATIONSHIP :: **relates (1,1)**

associates (0,n) :: MATERIAL LOCATION PARTICIPATION :: **associates_to (1,1)**

associates_to (0,n) :: PARTY LOCATION PARTICIPATION :: **associates (1,1)**

associates (0,n) :: TARGET PARTICIPATION :: **associates_to (0,1)**

Attributes of: **LOCATION**

Current Status Date Time Range : IVL<TS>
The time range during which the current location status is or was active.

Location Identifier : SET<II>
An instance identifier that identifies the location. This could include, among other things, identifiers assigned to a property within a registry office or other organization tracking plots of land.

Location Narrative Text : FTX
A free text note that carries additional information related to the location. This could include instructions for finding the location when postal information is inadequate. It could also include information useful to people visiting the location (e.g., “Beware of dog”).

Location Setting Code : CV
Code for the location environment. Examples might include public, private, federal, and unknown.

Location Status Code : CV
An indication of the validity of the location. Examples might include verified, unverified, and unable to verify.

Location Type Code : CV

Code that indicates the type of location. Includes residence, office, restaurant, hospital, daycare center, ship, prison, nursing home, or district such as census tract or congressional district.

Class: **LOCATION RELATIONSHIP**

Associated with: **LOCATION**

Description of: **LOCATION RELATIONSHIP**

An association between two locations. This relationship is important in public health reporting and investigations to describe how sites of public health importance are associated, for instance: fourth floor of hospital "has as part" the neonatal ICU. Here, the location relationship, "has as part", describes the association between two locations, a particular ICU and the hospital floor. Another example might be juice maker's apple orchard "is next to" farmer's cow pasture. One can also link telecommunication locations or postal locations to physical locations, for instance, 123 Main Street, Doraville, GA 30256 "is geolocated by" +33 47.966, -84 19.508.

This structure is not needed to link multiple locations, e.g., home address, email address, business address, to a single party. That requirement is supported through linking location information to party with party location participation.

Associations for: **LOCATION RELATIONSHIP**

relates (1,1) :: LOCATION :: **is_source_for (0,n)**

Attributes of: **LOCATION RELATIONSHIP**

Location Relationship Date Time Range : IVL<TS>

The period in time during which the relationship between the two location instances is effective. The time interval can be open at either end. That is, both the start and stop dates for the participation could be indicated, or either start or stop by themselves.

Location Relationship Type Code : CV

Indicates the type of relationship between the two locations. For example, "same as", "adjacent to".

Class: **MATERIAL LOCATION PARTICIPATION**

Associated with: **LOCATION**

MATERIAL

Description of: **MATERIAL LOCATION PARTICIPATION**

Material location participation indicates the location where an item of material is or was to be found.

Associations for: **MATERIAL LOCATION PARTICIPATION**

associates_to (1,1) :: LOCATION :: **associates (0,n)**

associates_to (1,1) :: MATERIAL :: **associates (0,n)**

Attributes of: **MATERIAL LOCATION PARTICIPATION**

Participation Date Time Range : IVL<TS>

Indicates the period in time during which the material item is or was to be found at the location. For example, the date a specimen arrived at the location. The time interval can be open at either end. That is, both the start and stop dates for the participation could be indicated, or either start or stop dates by themselves.

Participation Type Code : CV

Code for the participation role of the material at the location. Examples might include “resides at”, “originated at”, and “destined for”.

Class: **PARTY LOCATION PARTICIPATION**

Associated with: **LOCATION**
PARTY

Description of: **PARTY LOCATION PARTICIPATION**

Party location participation indicates the relationship between a party and a location. The party may be an organization that owns several facilities or locations. The participation role would be that of owner of the facility at this location. Another role for a party would be a person who "works at" a location.

Associations for: **PARTY LOCATION PARTICIPATION**

associates (1,1) :: LOCATION :: **associates_to (0,n)**

associates_to (1,1) :: PARTY :: **associates (0,n)**

Attributes of: **PARTY LOCATION PARTICIPATION**

Current Status Code : CV
Code for the status of the participation between the party and the location.

Current Status Effective Date : TS
The effective date for the current party location role status.

Participation Date Time Range : IVL<TS>
Indicates the period in time during which the party is related to the location. The time interval can be open at either end. That is, both the start and stop dates for the participation could be indicated, or either start or stop by themselves.

Participation Type Code : CV
Code for the participation role of the party at the location. Examples might include owner, occupant, visitor, worker, and client.

Class: **PHYSICAL LOCATION**

Subtype of: **LOCATION**

Description of: **PHYSICAL LOCATION**
Physical location information makes it possible to find the location on a map or by examination of surveyor's documentation or by reference to a land or property registry.

Attributes of: **PHYSICAL LOCATION**

Latitude Quantity : ST
Indicates the latitude of the location as measured in degrees north or south of the equator.

Location Name : ST
The name of the location as it might be referred to on a map or in a registry.

Longitude Quantity : ST
Indicates the longitude of the location as measured in degrees west or east of the prime meridian at Greenwich, England.

Property Location Text : FTX
A description of the property that is sufficiently precise to enable someone to locate the property and to recognize its boundaries. The description can be

formulated as in terms of the property boundaries, or in terms of specific lots or parcels that are located within a legal entity such as a township, county, or other legally defined territorial entity. In some cases the description will be drawn from the legal description of a property as recorded on a deed or other legal paper.

Class: **POSTAL LOCATION**

Subtype of: **LOCATION**

Description of: **POSTAL LOCATION**

Information used to direct mail to a particular location, or to find the location using information to be found on a street map.

Attributes of: **POSTAL LOCATION**

Address Directions Text : FTX

Descriptive information to assist a party in finding a particular location. This information is intended to supplement or replace street address information.

Street Address Text : AD

Text used for an address label. This could include street address information, or postal directions using a box number to send mail to a post office box, a rural free delivery box, or a military post office. It also includes lot or address number when the address refers to an apartment building or housing complex.

Class: **TELECOMMUNICATION LOCATION**

Subtype of: **LOCATION**

Description of: **TELECOMMUNICATION LOCATION**

An electronic address for a party that provides the mechanism to contact the party, to send messages, or to access information relevant to the party. Examples include a telephone number, an email address, a World Wide Web URL. This is distinguished from a postal address.

Attributes of: **TELECOMMUNICATION LOCATION**

Electronic Address Text : TEL

The number or other string that is entered to contact a particular telephone or other electronic location.

Personal Identification Number : ST

An identification number assigned to a person, and used to access a communication device such as a beeper. Often referred to as a PIN.

Time Zone Text : ST

Text indicating the time zone in which a telephone is located.

Materials Subject Area

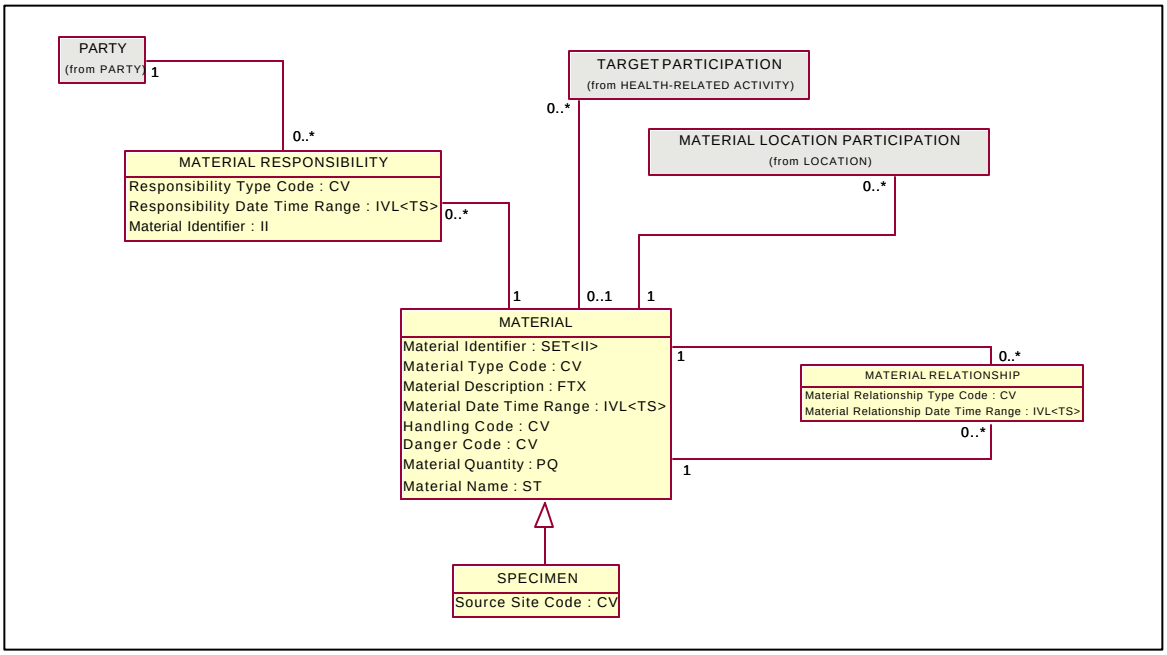

Figure 4. Materials Subject Area Diagram

The classes and attributes for the Materials subject area are described below.

Class: **MATERIAL**

Supertype of: **SPECIMEN**

Associated with: **MATERIAL LOCATION PARTICIPATION**
MATERIAL RELATIONSHIP
MATERIAL RESPONSIBILITY
TARGET PARTICIPATION

Description of: **MATERIAL**

Material is defined according to Webster's: 1) the elements, constituents, or substances of which something is composed or can be made; 2) matter that has qualities which give it individuality and by which it may be categorized.

In public health, interest in materials commonly arises when a material is a vehicle for a disease agent, or is suspected of being such a vehicle. For example, when a case investigation considers the question of whether a bowl of potato salad is contaminated with *Salmonella* organisms, the potato salad might be recorded as an item of material. Note that this assumes that the identity of the potato salad needs to be captured. In some cases it would be sufficient to record an observation that

the contaminated food was potato salad. It is also possible, when collecting information about the bacteria, to capture it as an item of material.

Other materials or entities of interest to public health may include an independent, separate, or self-contained substance or object, such as a lake, a pool, a waterpark, resort, campsite, ship, airplane, or train that might serve as a source or vehicle of exposure to a health hazard. For example, a public health investigation can center on the question of bacterial or other contamination of a site such as a ship or swimming pool. Specimens can be taken from such materials just as specimens can be taken from parties, whether human or otherwise.

Associations for: **MATERIAL**

associates (0,n) :: MATERIAL LOCATION PARTICIPATION :: **associates_to (1,1)**

relates (0,n) :: MATERIAL RELATIONSHIP :: **is_source_for (1,1)**

associates (0,n) :: MATERIAL RESPONSIBILITY :: **associates_to (1,1)**

associates (0,n) :: TARGET PARTICIPATION :: **associates_to (0,1)**

Attributes of: **MATERIAL**

Danger Code : CV

A code signaling whether there are certain dangers or hazards associated with this material. For example, "Examine under hood", "Wear gloves".

Handling Code : CV

A code to describe how the material needs to be handled to avoid damage. For example: "Do not expose to light", "Keep at certain temperature".

Material Date Time Range : IVL<TS>

An indication of the time interval during which the material is in existence.

Material Description : FTX

A free text description of the material. May contain multimedia, such as a drawing or image depicting the material.

Material Identifier : SET<II>

The identifier assigned to an individual material item.

Ideally each entity will have only one identifier assigned to it. However, since different systems will maintain different material databases, there may be different

instance identifiers assigned by different systems. Note that for serial numbers assigned by specific manufacturers, catalog numbers of specific distributors, or for inventory numbers issued by owners, the attribute Material Identifier in the Material Responsibility class can also be used. This allows clearer expression of the fact that a specific party associated with that material assigns such a code.

Material Name : ST

Name of the material. This is important in special cases such as the name of a lake, an amusement park, or a cruise ship

Material Quantity : PQ

An indication of the amount of material. This could be a count or a quantity. For example, 2 liters of water, 25 vials of blood.

Material Type Code : CV

This code describes the kind of material. No single terminology is expected to provide all concepts that are types of material, since it is simply too broad a domain. Instead of limiting the Material Type Code to a single domain, various coding systems may be used.

For example, specimen types (e.g., whole blood, serum, and urine) can be used in this attribute. For pharmacological substances the U.S. National Drug Code (NDC) may be applicable. For other types of materials of interest to public health, such as lakes, rivers, national parks, trains, planes, or ships, other coding systems will be applicable.

Class: **MATERIAL RELATIONSHIP**

Associated with: **MATERIAL**

Description of: **MATERIAL RELATIONSHIP**

Material relationship captures the relationship between two items of material. Material relates to other material largely in some kind of whole-part or containment relationship. The special functioning of the material relationship depends on the role of material, i.e., whether the material is a discrete thing, a homogenous substance, or a container. Material can be all of those forms.

Associations for: **MATERIAL RELATIONSHIP**

is_source_for (1,1) :: MATERIAL :: **relates (0,n)**

is_target_for (1,1) :: MATERIAL :: **relates (0,n)**

Attributes of: **MATERIAL RELATIONSHIP**

Material Relationship Type Code : CV

Code for the type of material association. Every relationship type implies certain roles for the material on either side of the relationship. For example, there is a relationship between a blood specimen and the species of bacteria cultured from it, between a dish of food and the ingredients used to make it, and a lake and the sample collected from it. Thus examples of material relationship codes include: is cultured from, is an ingredient of, and is a sample from.

Material Relationship Date Time Range : IVL<TS>

The period of time during which the relationship between the two materials is valid.

Class: **MATERIAL RESPONSIBILITY**

Associated with: **MATERIAL**
PARTY

Description of: **MATERIAL RESPONSIBILITY**

Description of the type of relationship between a party and an item of material. Material can have many kinds of relationships with parties. Relationships between material and parties are included here since there are generally one or more parties responsible for managing an item, or for performing particular functions with it.

For example, manufacturing is an activity in which a party or parties acts on material. In some instances we may simply be interested in who made the material. We may also be concerned with how the material item has been processed or treated. For example, if the manufacturing of the material resulted in contaminated or doctored medications, or food was not held at or cooked to proper temperatures, there are significant implications for public health.

An important example of material responsibility is the role of a party as the provider or receiver of a specimen. For example, a lake or a food item or a person may be the source of a specimen, and a public health official may be the person who obtains the specimen (the specimen may be a lake or food sample, a body part, blood sample, sputum, or feces). Owner, distributor, and custodian/holder are additional examples of relationship types between material and party.

Similarly, when a material item is implicated as a vehicle for a disease condition, such as a food item that is contaminated with *Salmonella* organisms, the material responsibility class provides a way to record party responsibility for the food item. This could include recording the party who was responsible for its pasteurization, the party who prepared the food, or the party responsible for storing it. For

medications or intravenous solutions, this might be the party responsible for sterilization or for mixing the solution.

Associations for: **MATERIAL RESPONSIBILITY**

associates_to (1,1) :: MATERIAL :: **associates (0,n)**

associates (1,1) :: PARTY :: **associated to (0,n)**

Attributes of: **MATERIAL RESPONSIBILITY**

Material Identifier : II

An identifier assigned to a material item in the context of its relationship with a responsible party. Different responsible parties may give the same piece of material different identifiers. For example, a manufacturer may assign a manufacturer ID and a distributor may assign a catalog number. All those identifiers can in principle occur under the Material ID attribute, i.e., as a property of the material itself. However, this attribute allows one to make the scope of the ID more clear, ie., it helps to easily distinguish a specific manufacturer's ID from a distributor's ID much more clearly than can be done using the assigning authority component of the instance identifier datatype.

Responsibility Date Time Range : IVL<TS>

Indicates the period of time during which the responsibility holds.

Responsibility Type Code : CV

Specification of the kind of responsibility that the party takes on with respect to the material. Examples might include owner, responsible for preparation, custodian.

Class: **SPECIMEN**

Subtype of: **MATERIAL**

Description of: **SPECIMEN**

A specimen is a part, fraction, aliquot, component, tissue sample, body fluid, food, or other substance that is collected in a health-related activity to support the assessment, diagnosis, or treatment of a party.

Attributes of: **SPECIMEN**

Source Site Code : CV

The source site code indicates from where, in relationship to the specimen source, the specimen is taken. For persons and non-person living organisms, the valid domain is a list of body sites. This is an attribute of the specimen, since it may be relevant in some cases, e.g., if multiple liver needle biopsies are taken from different lobes and locations of the liver. In the case of material items such as restaurants or lakes, the site code indicates from where the specimen was taken. In the case of a lake, this could be, "near intake", or "at swimming site". In the case of a restaurant, this could indicate a typical site in the restaurant such as within the meat grinder.

Parties Subject Area

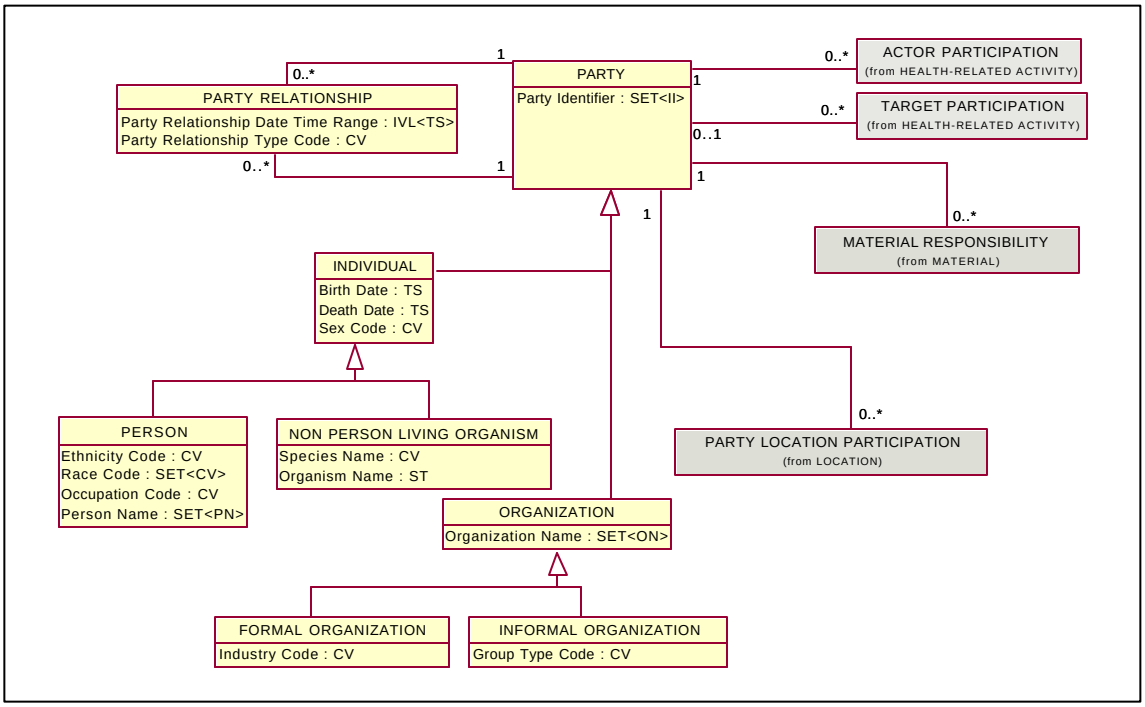

Figure 5. Parties Subject Area Diagram

The classes and attributes for the Parties subject area are described below.

Class: **FORMAL ORGANIZATION**

Subtype of: **ORGANIZATION**

Description of: **FORMAL ORGANIZATION**

A formal organization is an administrative and functional structure with common objectives. Examples in public health might include state-based public health membership organizations such as the Association of Public Health Laboratories (APHL), Association of State and Territorial Health Officials (ASTHO), the Council of State and Territorial Epidemiologists (CSTE), National Association of County and City Health Officials (NACCHO), National Association for Public Health Statistics and Information Systems (NAPHSIS), as well as individual organizations such as California Department of Health Services, Dekalb County Health Department, Blue Cross/Blue Shield Health Plans, Kaiser Permanente Health Maintenance Organization, Quest Diagnostics, Environmental Protection Agency.

Attributes of: **FORMAL ORGANIZATION**

Industry Code : CV
Code for the type of activity or industry in which the organization is engaged.

Class: **INDIVIDUAL**

Subtype of: **PARTY**

Supertype of: **NON-PERSON LIVING ORGANISM**
PERSON

Description of: **INDIVIDUAL**
An individual is a human person or other single organism.

When non-person living organisms are under consideration, their identity should only be recorded as a party when it is reasonable to do so, such as when they need to be recorded in reference to a individual or series of health-related activities. Note that parties can be identified in order to record an association to a material item or to a location. This is not likely to occur for a non-human living organism except in the non-trivial case of specimens. As a general rule, such non-individually identified organisms as microorganisms and viruses will not be recorded as parties. Information about them will be captured as observations.

Attributes of: **INDIVIDUAL**

Birth Date : TS
Date on which the individual was born.

Death Date : TS
Date on which the individual died.

Sex Code : CV
Code for the individual's sex at birth. Includes Male and Female.

Class: **INFORMAL ORGANIZATION**

Subtype of: **ORGANIZATION**

Description of: **INFORMAL ORGANIZATION**
An informal organization is a casual grouping or cluster of individuals with common interests, characteristics or exposures, or relationships. An informal organization can include individuals who do not recognize their relationship to the rest of the group, and in fact, this class is particularly intended to represent populations or groups of interest to public health, e.g., persons who are smokers,

persons of a certain age or race, persons exposed to the same chemical or agent, and persons who are HIV-positive. The concept of informal organizations also includes such clusters as families, neighborhoods, support groups, and groups of migrant workers. The informal organization can group non-human parties as well. Therefore it includes herds of cattle, canine litters, and prides of lions.

Attributes of: **INFORMAL ORGANIZATION**

Group Type Code: CV

Code for the type of informal organization. Examples include groups such as families, Rotary Club members, girl scouts, retired persons, persons with heart disease, alcoholics, persons vaccinated against measles, persons who are chronic typhoid carriers, or patients on a given floor or ward of a hospital.

Class: **NON-PERSON LIVING ORGANISM**

Subtype of: **INDIVIDUAL**

Description of: **NON-PERSON LIVING ORGANISM**

A non-person living organism is an individual living thing other than a human being that is sufficiently important in its own right to model as a party. For example, this includes pets and working or farm animals whose condition is under investigation.

Normally, other living clusters such as bacteria, parasites, viruses, prions, and insects, are modeled as specimens. Information about them is captured as an observation or observations. Such living clusters should only be recorded as parties when it is necessary to capture multiple references to the same individual in the course of a health-related activity.

Attributes of: **NON-PERSON LIVING ORGANISM**

Organism Name : ST

The name assigned to an animal or other organism. For example, the name assigned to a pet or to a working animal such as a racehorse.

Species Name : CV

The name of the species, including both the genus and the species. This value is drawn from a coded domain that contains the names of the known species.

Class: **ORGANIZATION**

Subtype of: **PARTY**

Supertype of: **FORMAL ORGANIZATION**
INFORMAL ORGANIZATION

Description of: **ORGANIZATION**

Organizations provide a way to recognize the grouping and/or collective action of individuals. An organization may be a group of functions operating as a unit. Examples are managed care organizations, hospital systems, State Health Departments, and regulatory agencies. Such an organization is modeled as a formal organization. An organization may also be simply a group of interest that has been assembled or defined in some informal manner. This type of organization is modeled in the PHCDM as an informal organization. Examples of such are social groups or units such as families, boy scouts, day care attendees, and college students.

Attributes of: **ORGANIZATION**

Organization Name : SET<ON>
Name of the organization.

Class: **PARTY**

Supertype of: **INDIVIDUAL**
ORGANIZATION

Associated with: **ACTOR PARTICIPATION**
MATERIAL RESPONSIBILITY
PARTY LOCATION PARTICIPATION
PARTY RELATIONSHIP
TARGET PARTICIPATION

Description of: **PARTY**

A party is an individual or organization that is specifically of interest to public health. This model includes the concept of "party", in order to clearly represent the similar ways that the different kinds of party are related to health-related activities, materials, and locations. These similarities are particularly relevant in the public health context due to the broad range of concerns that come up.

Something is captured as a party when there is a specific interest in its associations with health-related activities. That is to say, information is captured about a particular individual or organization that makes it desirable to record its individual existence. Usually this implies there will be a series of associations with that

individual that need to be linked. This distinction is important because information can also be captured as an observation (i.e., a health-related activity). For example, we expect that pets and specific farm animals such as horses and cows will be captured as parties (non-person living organisms).

Concepts that are not considered parties include purely material entities, such as lakes or parks. These are considered to be a type of material. Bacteria discovered within a specimen will be captured as observations made on that specimen.

The best way to illustrate this point is through the use of examples. Public health interventions are sometimes applied to specific persons. This includes the delivery of treatment to prevent the development of tuberculosis, a vaccination given to a patient exposed to rabies. It also includes the delivery of information, as when a sexual partner of a patient with a sexually transmitted disease is provided with counseling and clinical information about the disease (along with therapy to prevent disease).

Public health interventions are sometimes applied to organizations. Note that this model treats groups of people as informal organizations. Examples include providing vaccinations and information to the members of a boarding school where a case of meningitis was diagnosed, and the delivery of health warnings to the general public when *Shigella* organisms are detected in a commercial food product. Education campaigns related to such topics as AIDS prevention, the dangers of tobacco use, and the importance of calcium in diets are regarded as public health interventions and may be delivered to such "organizations" that include the population of a city, state, or region, or to specific age cohorts or otherwise identifiable groups.

Public health interventions are sometimes applied to non-person living organisms. For example, dogs living as pets within a neighborhood might receive additional rabies inoculations when several dead and infected raccoons were found in the vicinity. Members of a herd of cattle might be treated when disease was encountered in one of them. Note that within this model an informal organization includes relevant groupings of individuals. These individuals could be persons or non-person living organisms. Therefore, a herd of cattle is an informal organization.

Associations for: **PARTY**

associates (0,n) :: ACTOR PARTICIPATION :: **associates to (1,1)**

associated to (0,n) :: MATERIAL RESPONSIBILITY :: **associates (1,1)**

associates (0,n) :: PARTY LOCATION PARTICIPATION :: **associates_to (1,1)**

relates to (0,n) :: PARTY RELATIONSHIP :: **is source for (1,1)**

associates (0,n) :: TARGET PARTICIPATION :: **associates to (0,1)**

Attributes of: **PARTY**

Party Identifier : SET<II>
A party identifier is a value that identifies a party.

Class: **PARTY RELATIONSHIP**

Associated with: **PARTY**
PARTY

Description of: **PARTY RELATIONSHIP**
A party relationship captures the relationship between two parties. Examples of party relationships might include sexual partners, marital relationship, primary caretaker and subject, and employment between parties. Further examples include parent to child, health care provider to patient, health coverage organization to patient. This class captures the relationship between a person and their foster parent, adoptive parent, relative, emergency contact, or spouse. This association generally refers to a relationship that exists outside of the particular event of current interest, such as a specific health-related activity.

Associations for: **PARTY RELATIONSHIP**

is source for (1,1) :: PARTY :: **relates to (0,n)**

is target for (1,1) :: PARTY :: **relates to (0,n)**

Attributes of: **PARTY RELATIONSHIP**

Relationship Date Time Range : IVL<TS>
The period of time during which the relationship between the two parties is valid.

Relationship Type Code : CV
Code for the type of party relationship. Examples might include is an employee of, is the sexual partner of, and is the parent/child of.

Class: **PERSON**

Subtype of: **INDIVIDUAL**

Description of: **PERSON**
A person is a human individual.

Attributes of: **PERSON**

Ethnicity Code : CV
Code for the person's ethnic background (e.g., Hispanic, non-Hispanic).

Occupation Code : CV
Code for the occupation in which the person is employed.

Person Name : SET<PN>
A Person Name is a name assigned to a person.

Race Code : SET<CV>
Code for the person's race (e.g., American Indian/Alaskan Native, White, African American, Asian, Hawaiian/Pacific Islander). The attribute repeats in order to record the multiple racial categories to which a person can belong.